Appendix A

Program/Project Summaries

Appendix A PROGRAM/PROJECT SUMMARIES

This section includes all program/project summary survey responses received from numerous water quality agencies, entities, etc. in California. The survey was sent to dozens of groups across the state; however, only a small proportion responded with complete information while several more groups responded with incomplete information.

Alameda Countywide Clean Water Program - Bioassessment in Alameda County Creeks

The primary focus of this program is to provide watershed characterization, assessment, and trend monitoring using rapid bioassessments. The Alameda Co. Flood Control and Water Conservation District sponsor this program.

Contact Person: Arleen Feng Alameda County PWA, 951 Turner Court, Room 300, Hayward, CA 94545 (510) 670-5575 arleen@acpwa.mail.co.alameda.ca.us

Sampling Method: California Stream Bioassessment Procedure (CSBP) Rapid Bioassessment Protocol (RBP)

Timeline of Sampling: 1998 - Present

Data Availability: 3-4 sites in 1998-2000, 10 in 2001. Watersheds: San Lorenzo Creek (1998-2001); Sausal Creek, Mission Creek, Sabrecat Creek (2001)

Purpose of Bioassessment:

- watershed characterization, assessment, trend monitoring
- NPDES permitting
- ambient water quality monitoring
- establishing reference conditions
- supporting habitat classification
- stream restoration

Description: ACCWP's stormwater management activities include this project to provide understanding of relatively small, highly urbanized watersheds, and develop macroinvertebrate community indicators as tools to assist local municipal watershed managers. Selection of sampling watersheds and sites was based on a) representation of different portions of urbanized Alameda County; b) availability of publicly owned reaches that could be accessed; c) relatively strong opportunities for / interest in restoration activities. Related volunteer monitoring with "streamside" educational protocol is ongoing in Sausal Creek.

California Department of Fish and Game (CDFG) Enforcement Case Program

CDFG investigates situations where reports of activities or pollution events in the surrounding watershed may have adversely impacted stream integrity and/or stability. The California Stream Bioassessment Procedure (CSBP) is used to measure deleterious effects to the biological community resulting from the pollution event.

Contact Person: Angie L. Montalvo (916) 358-4398, CDFG Aquatic Bioassessment Laboratory 2005 Nimbus Road, Rancho Cordova, CA 95670

Sampling Method: California Stream Bioassessment Procedure (CSBP) Rapid Bioassessment Protocol (RBP)

Timeline of Sampling: Wine Creek (May 2000 – Present), East Walker River (Oct 1999-Present), Slug Canyon Creek (Sept 2000), Weber Creek (Mar 2001- Present), Cherokee Creek (Aug 2001), Goose Creek (Apr 2001) Hangtown Creek (Sept 1998), F-1 Line Zone Flood Control Channel (Oct 2001)

Data Availability: Wine Creek (6 sites), East Walker River (39 sites), Slug Canyon Creek (6 sites), Weber Creek (15 sites), Cherokee Creek (3 sites), Goose Creek (3 sites) Hangtown Creek (5 sites), F-1 Line Zone Flood Control Channel (3 sites)

Purpose of Bioassessment: Investigation of pollution spills can be enhanced by measuring the biological and physical/ habitat condition of the receiving waters. Bioassessment can contribute to an enforcement case by documenting injury resulting from a spill of a known pollutant or can stand alone as evidence of a pollution event when chemical analysis is unavailable. Bioassessments are particularly helpful when a pollution event is reported some time after it occurs (thus preventing the collection of timely chemical samples) and when dealing with chemical spills where the substance rapidly dissipates, become diluted or flows as a pulse downstream. Bioassessments may be the only enforcement tool available for physical/habitat destruction, and for spills of substances with low or no toxicity values (sediment, nutrients and elemental metals), but which cause eutrophication or smother benthic communities in the water body.

Description: Under the CDFG 5650 Code Enforcement Case Program, each case is treated as an individual project, which addresses a specific problem of concern. Each project or case is categorized into a classification system based on pollution type: sediment, petroleum, chemical, and other. Benthic macroinvertebrate (BMI) sampling (as well as standard physical habitat, flow, gradient, and ambient chemistry) is conducted in a similar manner for each case (one or more control sites, one site at or near the spill/impacted area, and one or more sites downstream from the spill/impacted area). Often, additional follow-up/ recovery sampling will occur up to 3 years following a pollution event. The results of the bioassessments are used in a court of law to prosecute responsible parties for damages and to recovery departmental costs associated to the case.

California Department of Water Resources (Northern District) Bioassessment Program

The primary objectives of this program are to provide long-term background information, to determine water quality based on types and abundance of individual species, and to monitor impact assessment and FERC relicensing of major DWR hydroelectric facility.

Contact Person: Jerry Boles, Department of Water Resources, 2440 Main Street, Red Bluff, CA 96080 (530) 529-7326 bolesj@water.ca.gov

Sampling Method: DWR professional classic method – multiple sites (three riffles/three cross sections/three samples per cross-section); sort entire sample; identify to genus/species – rely on mathematical metrics as well as biology of insects to determine impacts/water quality.

Timeline of Sampling: 1975-Present

Data Availability: Over 100 sites per year throughout Northern California

Purpose of Bioassessment:

- Support State of CA bioassessment and monitoring
- Assess the biotic condition of surface waters in a highly modified agriculturally influenced ecosystem.
- Determine variability of aquatic organisms in natural and man-made conveyances within the Central Valley.

Description: DWR's long time bioassessment program has historically used classic, professional methods employing a frame to delineate sampling area and collecting downstream from frame in a kick net. Entire sample is sorted and identified. Purposes of program are to provide long-term background information, determine water quality based on types and abundance of individual species, impact assessment, and FERC relicensing of major DWR hydroelectric facility. CSBP sometimes used when we only want cursory assessment of organisms and actual species population information is not that important.

Central Coast Ambient Monitoring Program

The Central Coast Ambient Monitoring Program is conducting watershed characterization monitoring for the Central Coast Regional Water Quality Control Board, using a 5-year rotational strategy. It has been in place since 1998 and covers Santa Cruz, San Benito, Monterey, San Luis Obispo, Santa Barbara, and portions of San Mateo, Santa Clara, and Ventura counties in central California.

Contact Person: Karen Worcester, 81 Higuera Suite 200 San Luis Obispo, CA 93401

Sampling Method: California Stream Bioassessment Procedure (CSBP), Harrington (1996); some sites with protocols modified for low gradient streams

Timeline of Sampling: Ambient monitoring 1998 – Present, 5-year watershed rotational strategy (April – May sampling period); Morro Bay 1993-Present (although they missed a few years); Coastal confluence monitoring 1999-Present.

Data Availability: Morro Bay, 10-15 sites; Pajaro Watershed, 8 sites; Salinas Watershed, 13 sites; Santa Maria Watershed,10 sites; Santa Barbara Coast,12 sites; 28 coastal confluence sites.

Purpose of Bioassessment:

- Conducted as part of ambient assessment along with conventional water quality, sediment chemistry, and tissue bioaccumulation data
- Also evaluation of the effectiveness of BMPs in the Morro Bay watershed

Description: Bioassessment is used in conjunction with other water quality monitoring approaches to characterize condition. Approximately thirty sites are selected along the main stem at the primary discharge point of the watershed, above major tributary inputs, and at the lower ends of major tributaries. For the purposes of site selection a "major tributary" is defined as a watercourse which drains a minimum percentage of the rotation area or which is the major watercourse that drains a Hydrological Area, Hydrological Subarea, or watershed of special concern. Some sites are also located above and below areas of significant human activity, including urban development, agriculture, and point source discharges. Site selection is constrained by site accessibility, since conventional monitoring is done on a monthly basis. Benthic invertebrate sites are located upstream of conventional water quality sites, but out of the immediate influence of bridges. Other sampling activities are conducted at a subset of conventional water quality sites.

Another program component includes monitoring of coastal confluences, where rivers meet the ocean. This monitoring is conducted continuously, rather than in 5-year rotation. Benthic invertebrate samples have been collected at these sites for three years in a row, at approximately thirty sites. Data from this program will be assessed in the near future for its effectiveness at detecting water quality impairment.

The Morro Bay National Monitoring Program has approximately 10 sites, which have been monitored for six years in order to detect changes from implementation of Best Management Practices. Sites are primarily upstream and downstream of cattle exclusion areas.

Central Valley Regional Water Quality Control Board (Sacramento) - Surface Water Ambient Monitoring Program (SWAMP)

The primary focus of this project is to provide insight into the condition of the aquatic community beneficial uses in agriculturally dominated and effluent dominated waterbodies of the Central Valley.

Contact Person: Robert Holmes, 3443 Routier Rd., Ste. A, Sacramento CA 95827-3003 (916) 255-0749 holmesr@rb5s.swrcb.ca.gov

Sampling Method: California Stream Bioassessment Procedure (CSBP) Rapid Bioassessment Protocol (RBP)

Timeline of Sampling: Fall 2000 – Present. Spring & Fall index periods

Data Availability: Approximately 36 sites in the Sacramento River Watershed.

Purpose of Bioassessment:

- Watershed characterization, assessment, trend monitoring
- Research
- Ambient water quality monitoring

Description: The goal of this project is to provide a first step at identification of aquatic life stressors and associated development of ecological indicators in agriculturally dominated and effluent dominated waterbodies in the Central Valley.

Chicarita Creek Bioassessment Study for the Friends of Los Penasquitos Canyon Preserve, Inc.

The purpose of the Chicarita Creek Bioassessment Study is to assess impacts on the Chicarita Creek due to point-source discharge violations.

Contact Person: Andre Macedo, City of San Diego, Environmental Monitoring & Technical Services Division, 14103 Highland Valley Road, Escondido, CA. 92025 (858) 538-8193, amacedo@sandiego.gov

Sampling Method: California Stream Bioassessment Procedure (CSBP) Rapid Bioassessment Protocol (RBP)

Timeline of Sampling: May 2001-Present

Data Availability: 4 sites in the Los Penasquitos Watershed

Purpose of Bioassessment:

- Point-source/incident

Description: The study of this creek is funded by a fine assessed against a discharge violator. There had been no pre-event samples available of this site.

Contra Costa Monitoring and Assessment Plan (CCMAP)

The Contra Costa Monitoring and Assessment Plan (CCMAP) focuses on assessing the biological integrity of watersheds in Contra Costa County (Northern California) to reduce pollutants from entering the municipal separate storm sewer system (MS4) and protect beneficial uses of its water bodies.

Contact Person: Chris Sommers, Contra Costa Clean Water Program, 255 Glacier Dr., Martinez, CA, 94553

Sampling Method: California Stream Bioassessment Protocol (CSBP) (Harrington 1999)

Timeline of Sampling: 2001-Present

Data Availability: Currently 10 sites in Alhambra Creek watershed (16 sq. miles)

Purpose of Bioassessment:

- To comply with the Program's Joint Municipal NPDES Permits;
- To collect baseline information necessary to identify and reduce and/or eliminate stormwater pollutants in the County;
- To prioritize sub-basins within individual watersheds, allowing direction for future studies to determine types and sources of stormwater pollutants adversely affecting beneficial uses;
- To begin identifying specific land uses that may be contributing to decreases in biological integrity;
- To contribute valid data to a Bay/State-wide data set intended to characterize watersheds and possibly create an Index of Biological Integrity (IBI) for the region.

Description: The Contra Costa Monitoring and Assessment Plan (CCMAP) is a long-term strategy, which builds on previous special studies and data collection efforts. CCMAP is designed to assess the conditions of watersheds, water bodies, and water quality within Contra Costa County. CCMAP entails further characterization of watersheds and sub-watersheds, and the development of strategically placed monitoring stations where rapid bioassessment data can provide a valuable screening device to determine where water quality and watershed health are degraded or have the potential for degradation. The Program intends to conduct bioassessments in approximately 6-8 watersheds in the next four years.

California Department of Parks and Recreation Natural Resources Inventory, Monitoring, and Assessment Program (IMAP)

A pilot project began in 2001 for Wilder Ranch State Park near Santa Cruz, where four streams were sampled to assess water quality and the condition of aquatic ecosystems, with an intent that this data would serve as baseline measures for future monitoring.

Contact Person: Roy Woodward, Inventory, Monitoring & Assessment Program, P.O. 942896 Sacramento, CA 94296-0001 (916) 651-6940, rwoodw@parks.ca.gov

Sampling Method: California Stream Bioassessment Procedure (CSBP), Harrington (1996)

Timeline of Sampling: Spring (May-June) and Fall (Sept. – Nov.) 2001. Future sampling of the streams may take place depending on available funding.

Data Availability: Currently 11 sites have been sampled. Spring 2001 data is now available. Fall 2001 data will become available by February 2002.

Purpose of Bioassessment:

- Assess water quality and the condition of aquatic ecosystems
- Establish baseline measures for future monitoring

Description: A small full-time staff at Sacramento HQ supports field staff in all 266 state park units with collection and compilation of data for wildlife, vegetation, and physical resources (e.g. water quality, soils, caves, air quality). A pilot project began in 2001 for Wilder Ranch State Park near Santa Cruz, where four streams, Wilder Creek, Peasley Creek, Majors Creek, and Baldwin Creek have been sampled for water chemistry and macroinvertebrates. These are small, short perennial coastal streams that are mostly contained within Wilder Ranch State Park.

State park ecologists collected the macroinvertebrate samples. Richard Bottoroff, a contractor, performed the macroinvertebrate identifications. Water chemistry was taken with a portable sampling device, and habitat was characterized using the CDFG technique. Under a separate contract, steelhead were counted, red-legged frogs were counted, and fish and aquatic organism habitat was assessed. The final report for the project will assess the findings in relation to steelhead and other aquatic organisms in these streams and will be prepared by June 30, 2002.

Dry Creek Conservancy Watershed Monitoring Program

Physical, chemical, and biological assessment and monitoring of the aquatic resources of the watershed.

Contact Person: Gregg Bates

Sampling Method: Grab samples, benthic macroinvertebrate collection, fish surveys

Timeline of Sampling: Seasonal, and periodic

Data Availability: Data is currently being organized and put into data bases

Purpose of Bioassessment:
- Assess condition of streams
- Identify negative impacts
- Suggest management solutions

Description: None provided.

Feather River Watershed Monitoring Program

The purpose of the program is to obtain and make available baseline and continuing data from which trends in watershed health could be measured. The Feather River Watershed Monitoring Program is project of the Feather River Coordinated Resource Management Group.

Contact Person: Leslie Mink, Watershed Coordinator, or Jim Wilcox, Project Manager, Feather River Coordinated Resource Management Group, c/o Plumas Corporation P.O. Box 3880 Quincy, CA 95971 phone: 530-283-3739; fax: 530-283-5465; email: leslie@plumascounty.org Or plumasco@psln.com

Sampling Method:
Three riffles suitable for sampling are identified, beginning at the downstream extent of the survey segment. Identified riffles are composed of large gravel to cobble size substrate where the water surface is turbulent. Care is taken to not disturb the sample sites prior to sampling. This is the first measurement taken at each survey segment.

Once the three riffles are identified, measurements are taken from bottom to top (downstream to upstream) beginning at the farthest downstream riffle. A tape is placed parallel to the longest upstream-downstream axis and the length of the riffle is measured. The riffle is divided into equal segments of length. Three segments are randomly selected for sampling using a random numbers sheet. One of three lateral sampling locations (1/4, 1/2, 2/3 width from the right edge of suitable habitat) is randomly selected at each of the three selected segments.

Once the sampling locations have been selected, a D-net with a one-foot wide opening and a mesh size of 0.5mm is placed perpendicular to the flow, and adjusted as necessary to prevent flow under the net frame. An area upstream of the net that is one foot wide by two feet long is chosen for sampling.

Samples are sent to: The Buglab, Dept. Fish and Wildlife, Utah State University, Logan,UT 84322-5210.

Timeline of Sampling: Samples are usually collected once every two years; samples have been collected during the Summer 1999 and 2001.

Data Availability: Biological samples are collected at 19 of the 21 sites, which are strategically located at low-gradient "response" reaches near mouths of the major sub-watersheds; samples are still being processed and are not expected to be completed until summer 2002, however, data will be available on our website at feather-river-crm.org

Purpose of Bioassessment:

- To evaluate the effectiveness of stream restoration efforts
- To assess trends in watershed health
- To accompany other watershed data such as geomorphic data including permanent cross-sections, longitudinal profiles, bedload, bank stability, water temperatures, and flows, water quality, fish populations, etc.

Description:

The Feather River Coordinated Resource Management group has been in existence since 1985, and is a consortium of 21 public and private agencies and land management entities. Our primary mission is watershed restoration, which we successfully implement across jurisdictional boundaries. Since 1985, we have implemented over 40 restoration projects. Project monitoring has been an integral part of our program. In the late 1990's we realized the need for monitoring on a watershed scale. This type of monitoring will help us evaluate the impact of our projects on a larger scale, and allow an observation of trends in the health of the Feather River watershed.

Federal Energy Regulatory Commission Hydroelectric Relicensing and Repair

The SWRCB has authority to issue Clean Water Act (CWA) section 401 water quality certifications for hydroelectric facilities undergoing relicensing. To help us determine compliance with the CWA and Basin Plan we have been requesting that rapid bioassessment be completed to help assess water quality impacts.

Contact Persons: Russ Kanz (916) 341-5341, Sharon Stohrer (916) 341-5397; State Water Resources Control Board, P.O. Box 2000, Sacramento, CA 95812-2000

Sampling Method: California Stream Bioassessment Procedure

Timeline of Sampling: Completed during the relicensing process. Usually a single sampling program with limited follow-up. We are also requiring bioassessement to determine impacts of repair projects. A number of rivers have been completed with more planned.

Data Availability: PG&E –Stanislaus River (44 sites), Pit River (16 sites), Mokelumne River (26 sites), Feather River (?? sites), Fordyce Creek (?? sites): El Dorado Irrigation District – SF American River (?? sites)

Purpose of Bioassessment:

- Assess impacts to water quality

Description: Hydroelectric projects licensed by the FERC undergo relicensing every 30-50 years. Currently in California there are a large number of facilities either being relicensed, or will be relicensed soon. The State Water Resources Control Board has the authority to issue Clean Water Act (CWA) section 401 certifications for these facilities. The CWA 401 certification requires an assessment of the impacts to beneficial uses. We have been requesting that the licensees use rapid bioassessment to help determine impacts to water quality/beneficial uses. We also use bioassessment in addition to water quality monitoring to determine the impacts of hydroelectric repair projects. Upcoming projects include Southern California Edison relicensing – Upper San Joaquin River sampling (planned for 2001-2002) and PacifiCorp relicensing – Klamath River sampling (planned for 2002).

Hoopa Valley Environmental Protection Agency Water Quality Monitoring Program

Our primary goals are to use rapid bioassessment as a tool to sample all streams that have been damaged by fires and logging and to protect domestic water sources.

Contact Person: Forrest Blake, 1348 Hoopa, California 95546

Sampling Method: California Stream Bioassessment Procedure (CSBP) citizen monitoring method

Timeline of Sampling: Continuous monitoring of annual events

Data Availability: Available on the EDAS program

Purpose of Bioassessment:

- To make sure our streams are safe for our people

Description: We have continuous data recorders on our creeks as well as high flow stations. We feel that bioassessments are just one more component to our Water Quality Monitoring Program.

Los Angeles Regional Water Quality Control Board – Surface Water Ambient Monitoring Program (SWAMP)

Primary purpose is to design a distinctive monitoring program for each watershed based on its unique characteristics and based on what data exists and what data gaps are present. Because each watershed is treated individually, the approach to each watershed is different. For example, in the Santa Clara River watershed, a random design based on EMAP was employed because the watershed covers an extensive area and little is known about the watershed. The goal was to obtain an overall picture of the health of the watershed. On the contrary, Calleguas Creek watershed encompasses a much smaller area and a multitude of data exists. Therefore staff chose a directed sampling program to address each major tributary and stream within the watershed and chemical analyses where chosen based on the data that already existed. Further information can be obtained in the SWAMP Workplan document for fiscal years 2000/01, 2001/02, and 2002/03, edition date June 30, 2002.

Contact Person: Tracy Vergets, 320 W. 4th Street, Suite 200, Los Angeles, California, 90013; (213) 576-6661; tvergets@rb4.swrcb.ca.gov

Sampling Method: California Stream Bioassessment Procedure (CSBP) Rapid Bioassessment Protocol (RBP)

Timeline of Sampling: 2001-Present

Data Availability: currently 17 sties in the Santa Clara River sampled in 2001; 30 more to be sampled in 2002; 13 sites sampled in Calleguas Creek in 2001; 45 sites to be sampled in Santa Monica Bay WMA in 2003 with repeat sampling at 6 of the best stations in 2004 & 2005; 12 stations to be sampled in the Dominguez Channel and LA/LB Harbor Watershed in 2003.

Purpose of Bioassessment:

- Ambient water quality monitoring
- Establish reference conditions
- Watershed characterization, assessment, trend monitoring
- Determine attainment of beneficial uses
- Assess biological integrity of surface waters
- Detect biological responses to pollution
- Identify probable causes of impairment not detected by chemical or physical water quality analysis

Description:

The overall goal of the Site-Specific Monitoring portion of SWAMP is to develop site-specific information on representative sites or water bodies that are (1) known or suspected to have water quality problems and (2) known or suspected to be clean. This portion of SWAMP is focused on collecting information from sites in water bodies of the State that could be potentially listed or delisted under Clean Water Act Section 303(d). This workplan has been developed to implement the Site-Specific Monitoring Requirements of SWAMP per State Board directive. However, in Region 4, both the Site-Specific Monitoring goals and the Regional Monitoring goals have been integrated into one ambient

monitoring program. The scope encompasses the regional goals, while still obtaining site-specific information.

Per AB 982, monitoring is required in each hydrologic unit of the State at least once every five years. Region 4 proposes to visit each hydrologic unit one year ahead of the WMI schedule for targeted watersheds, which rotate on a five-year cycle. In this strategy, data will be gathered, analyzed, and interpreted in time to use the following year during NPDES permit renewals and other ongoing activities within the targeted watershed. Ultimately, the information from these analyses will be used in the water quality assessment for the targeted watershed. Other uses of this data include, but are not limited to, development of the 305(b) report and 303(d) List of Water Quality-Limited segments, TMDL development, and NPDES permit renewals.

The sampling and analysis will be used to assess the ambient conditions of the watersheds in Los Angeles and Ventura counties, and will further delineate the nature, extent, and sources of toxic pollutants, which have been detected or are suspected to be problematic for this region and its individual watersheds. Where applicable, a triad approach (benthic community analysis, water chemistry, and toxicity testing) is being used. In addition, bioaccumulation tests, historically funded through the statewide Mussel Watch and Coastal Fish Contamination Programs, are being conducted in order to address possible human health concerns (contaminants in edible fish tissue) and ecological concerns (benthic community impacts), which may result if the contaminants at a site are bioavailable for uptake by organisms. These bioaccumulation tests will help to demonstrate the bioavailability of contaminants at these stations and may identify impaired beneficial uses. There is also a large focus on bioassessment, which historically has been overlooked. The bioassessment performed will follow the California Stream Bioassessment Protocol developed by CDFG, which focuses on the benthic macroinvertebrate assemblage and a physical habitat assessment. The information gathered will be used in trend analysis, identifying impaired beneficial uses, as well as potentially in the development of an index of biological integrity.

Lahontan Regional Water Quality Control Board: Biological Assessment Program

The primary objective of this program is to incorporate consideration of biological integrity into the many regulatory and watershed management functions of the Lahontan RWQCB.

Contact Person: Thomas J. Suk, Regional Monitoring Coordinator, California Regional Water Quality Control Board, Lahontan Region, 2501 Lake Tahoe Blvd., South Lake Tahoe, CA 96150. Phone: (530) 542-5419; Email: <tsuk@rb6s.swrcb.ca.gov>

Sampling Methods: The Lahontan RWQCB is using and evaluating three different bioassessment sampling methods: (1) benthic macroinvertebrates, periphyton, and physical habitat assessments following protocols developed by Dr. David Herbst at the University of California's Sierra Nevada Aquatic Research Laboratory (SNARL); (2)

California Stream Bioassessment Procedures (CSBPs) developed by the California Dept. of Fish and Game; and (3) RIVPACS protocols being used in the Sierra Nevada by the U.S. Forest Service

Timeline of Sampling: 1995 - present

Data Availability: Approximately 350 surveys have been conducted at 200 sites in the Lahontan Region using the UC-SNARL method. At 40 of those 200 sites, sampling was conducted using three methods (e.g., UC-SNARL, CSBPs, RIVPACS) to facilitate quantitative comparison of the results provided by each of those three methods. At approx. 30 other sites (throughout the eastern Sierra Nevada) samples were collected using both the UC-SNARL and RIVPACS methods, and at 20 other sites (all in the Walker River drainage) samples were collected using both the UC-SNARL and USEPA-REMAP methods. Most of this data is not yet available, and lab identification and quality assurance procedures are still underway.

Purpose of Bioassessment:

- To establish regional "reference conditions" for benthic macroinvertebrates and periphyton in streams and rivers
- To assess the impacts of human activities on the biological integrity of streams and rivers
- To evaluate the effectiveness of stream & wetland restoration efforts, BMP implementation, and permit conditions
- To develop numeric targets for TMDLs
- To develop narrative and numeric biocriteria

Description: The Lahontan RWQCB began using bioassessment in 1995, in order to monitor the success of remediation efforts at the abandoned Leviathan Mine. A more concerted (i.e., region-wide) bioassessment program was begun in 1999, for the multiple purposes outlined above.

The current regional-scale effort is focused on developing reference conditions (based on benthic macroinvertebrates and periphyton) for the eastern Sierra "ecoregion," which covers six major watershed basins (e.g., Truckee River, Tahoe Basin, Carson River, Walker River, Mono Basin, Upper Owens River). Streams in this ecoregion were stratified based on stream order, and minimally-impaired sites were selected from each class of streams. Sampling has been conducted during the summer reference period (i.e., late June to early September), using protocols developed by Dr. David Herbst of the University of California's Sierra Nevada Aquatic Research Laboratory. As of this writing (i.e., 2001), the effort has focused on data collection and lab identifications; analyses of the data are pending.

The Lahontan RWQCB, via contract with the University of California (SNARL), is also using bioassessment data to: (1) evaluate the effectiveness of several stream & wetland restoration projects (e.g., Upper Truckee River, Bagley Valley); (2) evaluate the effectiveness of BMP implementation (e.g., Upper West Walker River, Bridgeport

Valley); (3) monitor the success of remediation efforts at Leviathan Mine; (4) verify and/or assess the effectiveness of regulatory permits (e.g., fish hatcheries, Grover Hot Springs State Park); and (5) develop targets based on benthic macroinvertebrates for sediment TMDLs (e.g., Squaw Creek, Heavenly Valley Creek).

The Lahontan RWQCB, via contract with the University of California (SNARL), is also conducting a comparison of three common bioassessment methods (e.g., UC-SNARL, CSBP, RIVPACS). Sampling was conducted using all three methods at forty (40) sites during the summer of 2000. The objective of this study is to evaluate the potential strengths and weaknesses of the various methods for use by the RWQCB.

Development of narrative and numeric biocriteria is a long-term goal of this project, and will be subject to available funding.

McCloud River Preserve Aquatic Macroinvertebrate Monitoring Program

The primary focus of this program is to document and analyze the aquatic macroinvertebrate community in the McCloud River and to use this information in conjunction with on-going water quality research to provide a baseline view of the state of the aquatic resources within the watershed.

Contact Person: John Crandall, McCloud River Preserve, P.O. Box 409, McCloud, CA 96057 (530) 926-4386

Sampling Method: California Stream Bioassessment Procedure (CSBP), Harrington (1996)

Timeline of Sampling: started in 1998 at citizen's level, 1999-2001 at professional level

Data Availability: All years data available (taxa and metrics) plus brief write-up for each year.

Purpose of Bioassessment:

- Assess water quality and the condition of aquatic ecosystems
- Establish baseline measures for future monitoring

Description: None provided.

San Diego Regional Water Quality Control Board: Biological Assessment Program

The primary objectives of this project are to introduce biological information to the San Diego Regional Water Quality Control Board's ambient monitoring program and to provide baseline data on the benthic macroinvertebrate BMI community in regional streams.

Contact Person: Linda Pardy, 9174 Sky Park Court, Suite 100 San Diego, CA 92123

Sampling Method: California Stream Bioassessment Procedure (CSBP), Harrington (1996)

Timeline of Sampling: May 1999 – Present

Data Availability: Approximately 48 sites

Purpose of Bioassessment:

- To include biological information in the San Diego RWQCB's ongoing water quality programs
- To create a species list of BMIs known from the region
- To establish a biological classification of different stream types in the region
- To identify potential reference sites for the San Diego regional bioassessments
- To determine the best index period for sampling BMI communities
- To select appropriate metrics for southern California stream bioassessments
- To assist with 305(b) assessments, 303(d) listings, development of TMDLs, assessments of nonpoint sources (NPS), and assessments of effectiveness of NPS management measures.
- To develop biocriteria

Description:

The bioassessment program will evaluate the biological and physical integrity of targeted inland surface waters in the San Diego Region and is designed to meet an obligation to assess the condition of the Region's waters relative to attainment of water quality standards. Information developed will be used for the Section 305(b) Water Quality Assessment, the Section 303(d) list of impaired water bodies, development of Total Maximum Daily Loads (TMDLs), assessments of nonpoint sources, and assessments of effectiveness of nonpoint source management measures. Information will also be used to define issues, set priorities, and evaluate effectiveness of actions under the Watershed Management Initiative.

This ambient bioassessment program will put initial emphasis on biological community structure monitoring. Only after the biological information indicates impairment will samples be chemically analyzed. It is assumed that municipal storm water co-permittees, the Regional Water Board, and citizen volunteer monitoring groups will be responsible for biological monitoring. The program will be in concert with the San Diego Region's *Watershed Management Plan.*

The Regional Water Board will use the information gained from these bioassessments to identify areas of stream impairment and most likely causes. For the coastal lagoons identified as impaired, the bioassessments will help to identify those areas of the influent streams, which are most significant contributors of pollutants. With the accompanying data on water column and sediment chemistry provided by various sources, the Regional Water Board can initiate a scientifically based TMDL development for each of the impaired streams and coastal water bodies.

In addition, the program will produce a workable IBI using a modified approach outlined by the USEPA. Ultimately, the results of this bioassessment program will be used to develop biocriteria, which will serve as the standard against which future assessment results are compared.

San Francisco Bay Regional Water Quality Control Board - Surface Water Ambient Monitoring Program (SWAMP)

Primary purpose is to establish screening-level ambient biological and physical monitoring in the region's streams along with chemical and toxicity monitoring, as well as establish reference conditions. Secondary purposes include impact characterization, pre- and post-project characterization, and support of regional efforts at habitat classification.

Contact Person: Steve Moore and Karen Taberski, 1515 Clay St., #1400, Oakland, CA 94612 (510) 622-2439; (510) 622-2424; smm@rb2.swrcb.ca.gov; kmt@rb2.swrcb.ca.gov

Sampling Method: California Stream Bioassessment Procedure (CSBP) Rapid Bioassessment Protocol (RBP)

Timeline of Sampling: 2001-Present; Spring Index Period (Mar- May)

Data Availability: 72 sites in 2001; 49 sites in 2002 3rd year: estimated 45 sites in 2003. Watersheds sampled: 2001 - Lagunitas Cr., Walker Cr., Suisun Cr., San Pablo Cr., Wildcat Cr., Arroyo Las Positas, San Leandro Cr.; 2002 - San Gregorio Cr., Pescadero Cr., Butano Cr., Stevens Cr., Permanente Cr.; 2003 - Petaluma R., San Antonio Cr. (Marin), San Mateo Cr., Mt Diablo Cr., Kirker Cr.

Purpose of Bioassessment:

- Ambient water quality monitoring
- Establish reference conditions
- NPDES permitting
- Point-source/incident monitoring
- Watershed characterization, assessment, trend monitoring
- Support habitat classification
- Stream restoration monitoring

Description: The three components that make up the Board's Regional Monitoring and Assessment Strategy (RMAS) include: 1) SWAMP funding from the State Water Resources Control Board for Regional Board-lead activities (these activities will concentrate on monitoring watersheds, lakes/reservoirs and bays and estuaries other than San Francisco Bay and will include other Regional Board programs such as State Mussel Watch, the Toxic Substances Monitoring Program and the Coastal Fish Contamination Program), 2) partner-lead watershed monitoring programs that are being conducted by

local agencies/groups and are of similar goals, structure and scope as the Regional Board-lead activities and 3) the San Francisco Estuary Regional Monitoring Program (RMP), funded by dischargers. Specific objectives of the Regional Board-lead SWAMP-funded monitoring program are to: 1) identify reference sites, 2) identify impacted sites or waterbodies in order to determine if beneficial uses are being protected, 3) identify the cause of impacts (i.e., sediment, specific chemical contaminants, temperature), 4) determine if these impacts are associated with specific land uses and 5) evaluate monitoring tools in watersheds in order to develop a program that uses the best environmental indicators to achieve the purposes of the program. Data developed in this program will be used for evaluating waterbodies for the Clean Water Act Section 305b report and the 303d list. Data will include physical, chemical, and biological information.

Santa Clara Valley Project

The primary focus of this project is to examine the factors influencing the development of bioindicators based on lotic macroinvertebrate assemblages in urban environmental settings. Little is known of the specific factors found in urban environmental settings that affect macroinvertebrate distributions. Determining the natural and anthropogenic factors that most influence the distribution of macroinvertebrates is a necessary step prior to developing bioindicators based on resident macroinvertebrate assemblages found in urban streams.

Contact Person: Dr. James L. Carter, US Geological Survey, 345 Middlefield Road Mail Stop 465, Menlo Park, CA, 94025

Sampling Method: Two macroinvertebrate collection methods were used. First, a semi-quantitative method that consisted of compositing 5 - 0.1 m^2 collections made from riffle habitats. Each of the 5 collections per sample was systematically located. Second, a multi-habitat collection made by collecting macroinvertebrates from all habitats in a reach (=1 pool/riffle sequence). Collecting effort was partitioned based on the percentage composition of various invertebrate habitat types found in the sampled reach. All collections were made using a D-frame kicknet fitted with a 500 μm mesh.

Timeline of Sampling: Samples were collected in May 1997 and September/October 1998.

Data Availability: 85 sites from 14 streams in the Santa Clara Valley area. These include:

San Francisquito Ck	Ross Ck.	Saratoga Ck.	Arroyo Calero
Guadelupe River	Coyote Ck.	Corte Madera Ck.	Guadelupe Ck.
Los Gatos Ck.	Penitencia Ck.	Los Trancos Ck.	Alamitos Ck.
Stevens Ck.	Barret Ck.		

Purpose of Bioassessment:

- Develop a baseline data set representing the distribution of benthic macroinvertebrates in the Santa Clara Valley area.

- Development of a macroinvertebrate dataset for evaluating the level of field and laboratory effort needed to conduct bioassessments.
- Establish the relationships between benthic macroinvertebrate assemblage composition and physical and chemical factors associated with an urban environmental setting.

Description:

Fourteen streams were Sampling locations were +/- equidistant, with sites set at approximately 2 km intervals. Eighty-five sites were sampled in total. The downstream limit of sampling was either the point of assumed or observed intermittent flow or where there appeared to be a tidal influence. The upstream limit was approximately 300 m. Sampling at all sites for both types of invertebrate collections occurred during May 1997 and for riffle collections only during September/October 1998.

Depth and velocity were measured at each riffle subsample location (5 locations per riffle). At each riffle DO, temperature, conductivity, and pH were measured at the time of invertebrate sampling. Qualitative estimates of riparian vegetation, instream algal and macrophyte cover also were made. Quantitative measures of channel morphology and pebble counts were made at each site. Lastly, dissolved nutrients and trace metals were measured at each site.

For more information see:

Carter, J. L., and S. V. Fend. 2000. The Distribution and Abundance of Lotic Macroinvertebrates during Spring 1997 in Seven Streams of the Western Santa Clara Valley area, California. U.S. Geological Survey, Open-File Report 00-346.

Carter, J. L., and S. V. Fend. 2000. The Distribution and Abundance of Lotic Macroinvertebrates during Spring 1997 in Seven Streams of the Santa Clara Valley area, California. U.S. Geological Survey, Open-File Report 00-68.

Tecolote Creek and Alvarado Creek Bioassessment Studies

The purpose of the Tecolote Creek and Alvarado Creek Bioassessment Studies is to assess impacts due to a sewage spill.

Contact Person: Andre Macedo, City of San Diego, Environmental Monitoring & Technical Services Division, 14103 Highland Valley Road, Escondido, CA. 92025 (858) 538-8193, amacedo@sandiego.gov

Sampling Method: California Stream Bioassessment Procedure (CSBP) Rapid Bioassessment Protocol (RBP)

Timeline of Sampling: May 2000-Present

Data Availability: 3 sites in 2000, 4 sites in 2001, and 5 sites in 2002 located in the San Diego Watershed.

Purpose of Bioassessment:

- Point-source/incident

Description: None provided.

Truckee River Aquatic Monitors Bioassessment Program

The primary purpose of this program is to obtain data for watershed characterization, assessment, and trend monitoring in addition to educating the public and decision makers. Secondary purposes include ambient water quality monitoring, pre- and post-project monitoring, and establishing reference conditions in the watershed.

Contact Person: Jill Wilson, 2501 Lake Tahoe Blvd., South Lake Tahoe, CA 96150 (530) 542-5449 jwilson@rb6s.swrcb.ca.gov

Sampling Method: California Stream Bioassessment Procedure (CSBP) Rapid Bioassessment Protocol (RBP)

Timeline of Sampling: 1999-Present

Data Availability: Approximately 3-5 per year throughout the Truckee River Watershed

Purpose of Bioassessment:

- Ambient water quality monitoring
- Establish reference conditions
- Watershed characterization, assessment, trend monitoring
- Support habitat classification
- Stream restoration monitoring
- Education

Description: TRAM is an all-volunteer group that follows the CSBP protocol to collect samples. Sampling occurs within the Truckee River Watershed from the Lake Tahoe outlet to the California state line. Most samples are sent out for professional identification. However, during the winter the group does do some of its own identification at the CSBP citizen's level.

UCLA/Los Angeles Regional Water Quality Control Board Biological Assessment Project

The purpose of this project is to determine the biological health of streams relative to land use in three southern California watersheds (Malibu, Calleguas, and Santa Clara) using modifications to existing protocols. This work was conducted by University of California Los Angeles and

funded by Los Angeles Regional Water Quality Control Board with the goal of collecting data that would be used in the generation of nutrient TMDL's for southern California watersheds, but in so doing, new methods were explored for determining the relationship between human influences and the biological health of streams.

Contact Person: Steven F. Lee M.S. and Rich Ambrose, Ph.D. UCLA. Department of Environmental Health Sciences, 46-059 CHS Building, Los Angeles, CA 90095-1772

Sampling Method: Combination of CSBP (Harrington and Born, 2000) and modified USEPA REMAP, Lazorchak and Klemm (1994) methods.

Timeline of Sampling: Fall, 2001 season

Data Availability: ~40 sites throughout three Southern California watersheds (Malibu, Calleguas, and Santa Clara). Data are public and will be available through LARWQCB sometime in the middle of 2002.

Purpose of Bioassessment:

- Determine the health of biological communities relative to human land use, incorporating new methodologies and metrics
- Collect data for use by Los Angeles RWQCB in the generation of nutrient TMDL's.

Description: Benthic invertebrates were collected according to CSBP methods to keep data comparable to other state agency bioassessment work, but then a modified EMAP-type protocol was superimposed over the riffle/reach to collect data on stream morphology, physical habitat, riparian vegetation, fish and fish habitat etc. Site selection involved targeted reaches rather than a probabilistic approach. The reach length and the number of transects were reduced, but with expanded data taken at each transect. We feel this was appropriate because 1. we targeted more homogeneous sites and 2. these southern California stream reaches tend to be more homogeneous in general. In addition, data for percent cover of macroalgae, vascular macrophytes, and diatoms, macroalgae biomass, and light meter measurements were added to the protocol. Streamside riparian vegetation data were enhanced with focus on cover of native and introduced species. More extensive data were taken alongside the benthic invertebrates including light meter readings, macroalgae, macrophyte, and diatom data, and substrate type including percent composition, embeddedness, and consolidation.

Upper Putah Creek Citizen Based Watershed Management Program

The Stewardship will organize, train and supervise citizen volunteers to monitor impacts to Upper Putah Creek and its tributaries from sediment and other non-point pollution sources and translate findings into restoration projects for the Stewardship to implement.
Funded by a 319(h) grant administered by Placer County Resource Conservation District.

Contact Person: Dwight Holford, Project Coordinator, Box 27 Middletown, CA 95461-0027 707-987-2600 showmums@jps.net

Sampling Method: California Stream Bioassessment Procedure (CSBP), Harrington and Born 2000

Timeline of Sampling: 2000-2002

Data Availability: March 2002

Purpose of Bioassessment:
- Support CA State bioassessment program
- Train citizen monitors
- Establish bioassessment program in the Upper Putah Creek Watershed
- Produce restoration projects
- Establish base for biocriteria in watershed

Description:
A team of citizen monitors has been established, led by a Ph.D. scientific advisor. By the end of this 319(h) project they will have surveyed the upper third of the watershed. A restoration project for St. Helena Creek will be proposed. They are helping other watershed groups establish bioassessment programs. They are also involved in education/outreach programs.

U.S. Environmental Protection Agency Central Valley Regional Environmental Monitoring and Assessment Program (REMAP)

The Central Valley REMAP project focused on assessing the biological integrity of agriculture-dominated waterbodies located throughout California's Central Valley, which comprises more than 48,000 miles of surface water and 16 percent of the land area of California and is one of the nation's most productive agricultural areas.

Contact Person: Peter Husby, USEPA Region 9 Laboratory, 1337 S. 46th St.; Bldg. 201, Richmond, CA 94804

Sampling Method: USEPA EMAP, Lazorchak and Klemm (1994)

Timeline of Sampling: 1994-1995

Data Availability: Approximately 87 sites in the Sacramento-San Joaquin Valley, covering approximately 24,000 square miles.

Purpose of Bioassessment:
- Support State of CA bioassessment and monitoring

- Assess the biotic condition of surface waters in a highly modified agriculturally influenced ecosystem.
- Determine variability of aquatic organisms in natural and man-made conveyances within the Central Valley.

Description: REMAP was initiated to test the applicability of the EMAP approach to answer questions about ecological conditions at regional and local scales. Using EMAP's statistical design and indicator concepts, REMAP conducts projects at smaller geographic scales and in shorter time frames than the national EMAP program. EMAP is a research program to develop the tools necessary to monitor and assess the status and trends of national ecological resources. EMAP's goal is to develop the scientific understanding for translating environmental monitoring data from multiple spatial and temporal scales into assessments of ecological condition and forecasts of the future risks to the sustainability of our natural resources. The objectives of REMAP are to: 1) evaluate and improve EMAP concepts for state and local use, 2) assess the applicability of EMAP indicators at differing spatial scales, and 3) demonstrate the utility of EMAP for resolving issues of importance to EPA Regions and states.

U.S. Forest Service - Pacific Southwest Region (California) Bioassessment Program

The primary focus is on establishing reference conditions by collecting macroinvertebrates from a network of both perennial and intermittent wadeable streams throughout the entire state of CA, mainly on Forest Service lands. There are 18 national forests in the region (Angeles, Cleveland, Eldorado, Inyo, Klamath, Lassen, Lake Tahoe Basin Management Unit, Mendocino, Modoc, Plumas, San Bernardino, Sequoia, Shasta-Trinity, Sierra, Six Rivers, Stanislaus and Tahoe)

Contact Person: Joseph Furnish, Ecosystem Conservation Division, 1323 Club Drive, Vallejo, CA 94592

Sampling Method: Hawkins, Ostermiller, and Vinson (1998)

Timeline of Sampling: 2000 - present

Data Availability: Approximately 176 sites in 2000 and 85 sites in 2001 located in the following watersheds: Klamath- North Coastal; Sacramento; Tulare-Buena Vista; San Joaquin; Central Lahontan; Central California Coastal; South California Coastal; North Mojave- Mono Lake.

Purpose of Bioassessment:
- Development of biocriteria and bioassessment protocol
- Monitoring of impacts from timber harvest, grazing and mining activities
- Ensure compliance with the Clean Water Act
- TMDL implementation
- Reference site characterization

Description: The primary effort has been on establishing reference condition by collecting macroinvertebrates from a network of both perennial and intermittent wadeable streams, that can serve as the basis for monitoring biological integrity and determining whether water quality has been degraded compared to reference condition. Reference condition will be based on development of a predictive RIVPACS (River InVertebrate Prediction And Classification System) model. Standard EPA Metrics will also be considered for use if it is determined that they are sensitive to disturbances at the site and watershed (approximately 10,000-50,000 acre) scale.

U.S. Geological Survey: National Water Quality Assessment (NAWQA) Program

The U.S. Geological Survey (USGS) implemented the National Water-Quality Assessment (NAWQA) Program to describe the status of and trends in the quality of the nation's surface water and ground water and to provide scientific understanding of the natural and human-induced factors that affect water quality.

Contact Person: Larry Brown, Placer Hall, 6000 J St, Sacramento, CA 95819-6129

Sampling Method: USGS NAWQA

Timeline of Sampling: San Joaquin-Tulare Basins 1992-95; Sacramento Basin 1995-98; Santa Ana Basin 1998-Present.

Data Availability: 17 sites in San Joaquin-Tulare Basins; 23 sites in Sacramento Basin; and 4 sites in Santa Ana Basin.

Purpose of Bioassessment:

- Describe current water-quality conditions for a large part of the Nation’s freshwater streams.
- Describe how water quality is changing over time, and
- Improve our understanding of the primary natural and human factors affecting water quality.

Description: Since 1991, the NAWQA program has been collecting and analyzing data and information in more than 50 major river basins and aquifers across the Nation. The goal is to develop long-term consistent and comparable information on streams, ground water, and aquatic ecosystems to support sound management and policy decisions. Three major river basins in California were assessed as part of this program: 1) Sacramento Basin, 2) San Joaquin-Tulare Basins, and 3) Santa Ana Basin.

Studies in the San Joaquin-Tulare Basins NAWQA Study Unit focus on the status of and the processes influencing the quality of surface water, ground water, and aquatic ecology. The Study Unit is located in central California and includes the San Joaquin Valley, the eastern slope of the Coast Ranges and the western slope of the Sierra Nevada.

In 1994, the Sacramento River Basin study unit team began planning assessment activities. The basin was subdivided into six physiographic subunits and nine ecological subunits that were determined to be the most influential natural factors affecting water quality. Stream sampling began in 1995 and lasted until April 1998. Much of the data collection focused on the Sacramento Valley and Klamath Mountain subunits, but ecological sampling also included the Cascade Mountains and Sierra Nevada subunits. Hundreds of water-quality characteristics were measured in different media during this time, including ground water, stream water, streambed sediments, and aquatic biological tissues. Fish, invertebrate, and algal communities and stream habitat also were sampled or assessed. In addition, spatial data such as geology, land use, hydrography, and other watershed characteristics were compiled into a geographic information system (GIS) to support the assessment. After April 1998, the project entered a period of less frequent sampling called the low-intensity phase.

The Santa Ana Basin study began in 1997. Study planning and analysis of existing data was done during the first 2 years of the study. After that 2-year planning period, surface- and ground-water and biological data were collected intensively for 3 years (termed the high-intensity phase). A low-intensity phase will follow for 6 years, during which water quality is monitored at a limited number of sites and areas that were sampled during the high-intensity phase. This combination of high- and low-intensity monitoring phases allows the NAWQA Program to examine long-term trends in water quality and aquatic ecology.

Ventura River Bioassessment Monitoring Program

The main purpose of this program is to assess the biological condition of the Ventura County Watershed and to ensure compliance with NPDES permit requirements.

Contact Person: Darla Wise, County of Ventura Flood Control Department, (805) 645-3942

Sampling Method: California Stream Bioassessment Procedure (CSBP), Harrington (1996)

Timeline of Sampling: Annual sampling Fall 2001- Present,

Data Availability: 15 sites

Purpose of Bioassessment:

- Assess biological health in the watershed
- Ensure compliance with NPDES permit requirements

Description: Bioassessments are conducted as part of an overall program to assess water quality for stormwater monitoring throughout the Ventura County Watershed. In addition to collecting biological samples, they also look at conventional

water quality
parameters. They also have a group of volunteers who collect water quality samples on a monthly basis at the bioassessment sites. Recently acquired a Water Sonde and anticipate monitoring nutrients (nitrate, nitrite and ammonia) chlorophyll a in addition to basic water quality parameters. Also plan to monitor fecal coliform and streptrococcus bacteria in future monitoring efforts.

Yurok Tribe Water Quality Program

The primary focus of this program is to provide ambient water quality data for the Klamath River watershed.

Contact Person: Kevin McKernan, PO Box 355 Orick, CA 95555
(707) 834-2536 / kevinmck@reninet.com

Sampling Method: California Stream Bioassessment Procedure (CSBP) Rapid Bioassessment Protocol (RBP)

Timeline of Sampling: 2001– Present. Spring & Fall index periods

Data Availability: 30 sites in the Klamath River Watershed.

Purpose of Bioassessment:

- ambient water quality monitoring
- research
- point-source/incident
- watershed characterization, assessment, trend monitoring
- establish reference conditions
- stream restoration
- education

Description: Sites include mainstem Klamath River during low flow conditions, bio-metrics used to support ambient physical and chemical monitoring. Sites in Lower Klamath tributaries support ambient physical and chemical monitoring, watershed trends, presence/absence of forest herbicide impacts.